UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/083,401	02/27/2002	Yoshiharu Maeno	M0289.0002/P002	7382

7590 12/13/2005

DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
41st Floor
1177 Avenue of the Americas
New York, NY 10036-2714

EXAMINER	
AHMED, SALMAN	
ART UNIT	**PAPER NUMBER**
2666	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/083,401	Applicant(s) MAENO, YOSHIHARU	
	Examiner Salman Ahmed	Art Unit 2666	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-12,14-22 and 24-32* is/are rejected.

7)☒ Claim(s) *2, 13, 23, 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 4, 5, 6, 9, 10, 22, 24, 25, 26, 27, 30, 31, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beshai et al. (US PAT 6570872), hereinafter referred to as Beshai, in view of Sinclair (Minimum cost wavelength-path routing and wavelength allocation using a genetic-algorithm/heuristic hybrid approach Sinclair, M.C.; Communications, IEE Proceedings-Volume 146, Issue 1, Feb. 1999 Page(s):1 – 7).

In regards to claims 1, 6, 22, 32 Beshai teaches a network node for a communications network (column 1 lines 9-10, switched data network) which comprises a plurality of network nodes (column 1 line 4, Data switches) interconnected by communication links (column 2 lines 60-61, direct channel paths and tandem channel paths) wherein said network node is one of plurality of network nodes, comprising: a first module (figure 1a element 83), having a plurality of input ports (figure 1a element 97) and a plurality of output ports figure 1a element 96), for handling a group of channels between input ports and output ports as a routing unit; a second module (figure 1a element 82), having an input port (figure 1a element 93) and an output port

(figure 1a element 92), for handling a channel between the input port and the output port as routing unit; a module state database for storing module cost data of first and second modules (column 13 lines 12-18, The global controller 162 maintains 2XN module-state matrix, one row of the matrix stores each module's available capacity on channels connecting the module to the core) a link state database for storing link cost data of said communication link (column 13 lines 12-18, 2XN module-state matrix, and the second row of the matrix stores the available capacity on channels connecting the core to each module) a switching system (figure 1a, element 84 and global controller 162 (FIG. 6)) for determining a route of minimum cost by using module state database and link state database and establishing, according to the determined route, a connection between one of a plurality of incoming communication links and one of the input port of first and second modules and establishing a connection between one of the output ports of first and second modules and one of plurality of outgoing communication links (column 13, lines 19-40, when a new connection request is sent from a module 84, 84a to the global controller 162, the sink module is identified. The corresponding entries in the module-state matrix are examined. If either entry is smaller than the connection capacity requested in the connection request, the connection request is placed in a standby queue (not shown). Otherwise, the connection request is entered in a connection request queue 280 shown in FIG. 10, and the entries in the 2.X.N module-state matrix are debited accordingly. Each entry in the connection request queue 280 includes three fields: a source module identifier 282, a sink module identifier 283, and a requested connection capacity 284. The standby queue has the same format as the

connection request queue. The connection capacity requested is preferably represented as a fraction of a capacity of a channel. A 20-bit representation of the channel capacity, for example, permits an integer representation of each fraction with a relative accuracy within 1 per million. A request entered in the request queue may be accepted if an internal route can be found as described in the following steps: (1) The request queue is sorted in a descending order according to capacity requirement before a matching process begins; (2) An attempt is made to find a direct path from the source module to the sink module for each connection request in the request queue. This involves carrying out a matching process as described above. The matching process is implemented for each entry in the request queue starting with the highest requested connection capacity. A request for a high connection capacity has fewer matching opportunities than a request for a small connection capacity. Thus, the requests for higher connection capacities are preferably processed before the available channel capacity is assigned to requests for low capacity connections. Each time a connection request is successfully assigned, each of the corresponding entries in the channel-vacancy matrices (242, 244) or (262, 264) is decreased by the value of the assigned capacity). In regards to claim 22, Beshai, in view of Sinclair teaches a management center (figure 6, a global controller 162) connected to network nodes via control channels (column 9 line 66, channel directed to the global controller 162).

In regards to claims 1, 22, 32 Beshai does not explicitly teach using cost data of self and other network nodes as well as link cost information to find minimum cost routing. In regards to claims 6, 27 Beshai does not explicitly teach second module

is capable of converting the wavelength of wavelength channel to a different wavelength. In regards to claims 3, 24, 31 Beshai does not explicitly teach link state database includes a first plurality of link entries for storing status of links to first and second network node and a second plurality of link entries for storing status of forwarding adjacency link between first and second network nodes, said second plurality of link entries containing a total cost of links and modules. In regards to claim 10, Beshai does not explicitly teach physical link and virtual link entries for storing status of concatenated links.

In regards to claims 1, 3, 10, 22, 24, 31, 32 Sinclair teaches using a cost model to optimize network for minimum cost routing. Sinclair teaches (section 2, page 2-4) to determine the cost of a given network; separate models for both links and nodes are required. For the nodes, a node effective distance was used as a way of representing the cost of nodes in an optical network in equivalent distance terms. It can be regarded as the effective distance added to a path as a result of traversing a node. The network cost is then taken to be the sum of the costs of all the individual links and nodes comprising the network. NOMaD represents networks as objects, coded in C++, composed not only of nodes, links and ordered sequences of paths, but also objects representing the network's adjacency matrix, connection matrix (which records link levels in hierarchical networks) and the traffic requirements. Further, networks include additional objects to represent the cable, fiber and wavelength-routed structure of a multi-wavelength optical network. In regards to claims 6, 27 Sinclair teaches (page 4), the wavelength chosen is the one that results in the smallest increase in overall path

length, given the constraint that all rerouting must be to lower wavelength numbers than the original wavelength of the path being shifted down.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Beshai's teaching by incorporating the concept of doing minimum cost routing calculation as taught by Sinclair. The motivation is that (as suggested by Sinclair, page 1) such approach is not simply to minimize NWR, but rather to obtain a minimum cost allocation. Experimental results from seven fifteen-node test networks, obtained using a tool for optical network optimization, modeling and design (NOMaD), suggest the GA/heuristic hybrid approach provides superior results compared to three recent wavelength-allocation heuristics, except when the network cost depends most heavily on wavelength requirement.

In regards to claims 4, 25 Beshai teaches (FIG. 2) a schematic diagram of a wavelength-multiplexed switch 100.

In regards to claims 5, 9, 26, 30 Beshai teaches (FIG. 1a) a schematic diagram of a hybrid switch in accordance with the invention, which includes N electronic modules 84, a channel switch 82 and a dedicated data switch 83, which switches only tandem connections. Each module 84 receives data traffic from subtending traffic sources through incoming feeder links 86 and delivers data traffic destined to subordinate sinks through outgoing feeder links 87. Local subtending data traffic is switched directly to subordinate sinks through each module 84 as indicated by the dashed line 85. Each module 84 receives W incoming channels 92 from the channel switch 82, and sends W

channels 93 to the channel switch 82. Each module 84 also receives B channels 96 from the data switch 83 and sends B channels 97 to the data switch 83.

3. Claims 11, 12, 14, 15, 16, 17, 20, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beshai, in view of Sinclair, in view of Uematsu et al. (US PAT PUB 2001/0019540), hereinafter referred to as Uematsu.

In regards to claims 11 and 12, Beshai, in view of Sinclair teach an optical switching node as described in the rejection of claim 1 above.

In regards to claims 11 and 12 Beshai, in view of Sinclair do not explicitly teach terminating circuitry for transmitting a message to neighboring network nodes for communicating the contents of module state database and receiving a message from said neighboring network nodes for updating module state database according to the received message.

In regards to claims 11 and 12, Uematsu teaches (page 2 section 0026 and 0027) the step of sending the topology data in any direction from any node, and circulating the topology data in the ring; and receiving the topology data by the node in a direction opposite to that of the above step and performing topology construction.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Beshai, in view of Sinclair's teaching by incorporating the teachings of storing and providing topology related update data to other nodes as taught

by Uematsu. The motivation is that (as suggested by Uematsu, page 2 section 0051) it is possible to set topology data individually for the part performing circulation in one direction and the other part performing circulation in the other direction, and, thereby, to improve the degree of freedom in setting topology data.

In regards to claim 15, Beshai, in view of Sinclair teach (Beshai ,FIG. 2) a schematic diagram of a wavelength-multiplexed switch 100.

In regards to claim 16, 20, Beshai, in view of Sinclair teach (Beshai ,FIG. 1a) a schematic diagram of a hybrid switch in accordance with the invention, which includes N electronic modules 84, a channel switch 82 and a dedicated data switch 83, which switches only tandem connections. Each module 84 receives data traffic from subtending traffic sources through incoming feeder links 86 and delivers data traffic destined to subordinate sinks through outgoing feeder links 87. Local subtending data traffic is switched directly to subordinate sinks through each module 84 as indicated by the dashed line 85. Each module 84 receives W incoming channels 92 from the channel switch 82, and sends W channels 93 to the channel switch 82. Each module 84 also receives B channels 96 from the data switch 83 and sends B channels 97 to the data switch 83

In regards to claim 17, Beshai, in view of Sinclair teach (Sinclair, page 4), the wavelength chosen is the one that results in the smallest increase in overall path length, given the constraint that all rerouting must be to lower wavelength numbers than the original wavelength of the path being shifted down.

In regards to claims 14, 21 Beshai, in view of Sinclair teach using a cost model to optimize network for minimum cost routing. Beshai, in view of Sinclair teach (Sinclair , section 2, page 2-4) to determine the cost of a given network; separate models for both links and nodes are required. For the nodes, a node effective distance was used as a way of representing the cost of nodes in an optical network in equivalent distance terms. It can be regarded as the effective distance added to a path as a result of traversing a node. The network cost is then taken to be the sum of the costs of all the individual links and nodes comprising the network. NOMaD represents networks as objects, coded in C++, composed not only of nodes, links and ordered sequences of paths, but also objects representing the network's adjacency matrix, connection matrix (which records link levels in hierarchical networks) and the traffic requirements. Further, networks include additional objects to represent the cable, fiber and wavelength-routed structure of a multi-wavelength optical network. In regards to claims 6, 27 Beshai, in view of Sinclair teach (Sinclair, page 4), the wavelength chosen is the one that results in the smallest increase in overall path length, given the constraint that all rerouting must be to lower wavelength numbers than the original wavelength of the path being shifted down.

4. Claims 7, 8, 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beshai, in view of Sinclair, in view Watanabe et al. (US PAT 6701088), hereinafter referred to as Watanabe.

In regards to claims 7, 8, 28, 29, Beshai, in view of Sinclair teach an optical switching node as described in the rejection of claim 1 above.

In regards to claims 7, 8, 28, 29, Beshai, in view of Sinclair do not explicitly teach first module comprises an optical regenerator module for simultaneously performing an optical regeneration process on a plurality of wavelength channels and second module comprises an optical regenerator module for performing an optical regeneration process on a wavelength channel.

In regards to claims 7, 8, 28, 29, Watanabe teaches (column 2 lines 1-21) of using optical regenerator in an optical switch during optical switching.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Beshai, in view of Sinclair's teaching by incorporating the teaching of using optical regenerator in an optical switch during optical switching as taught by Watanabe. Such techniques were well known to one of ordinary skills in the art at the time of the invention. Further motivation is that (as suggested by Watanabe, column 2 lines 1-21) in the WDM communication channel, wavelength-multiplexed signals WDMS provided to input optical backbone transmission lines OBB-11 to OBB-14 are demultiplexed for each wavelength in wavelength demultiplexing parts 51-1 to 51-3, then the optical signals of the individual wavelengths are regenerated by optical regenerators 52-1 to 52-16, respectively, then the regenerated optical signals are cross-connected by optical switches 53-1 to 53-4 to predetermined routes and are multiplexed in wavelength multiplexing parts 54-1 to 54-4, from which the wavelength-multiplexed optical signals are provided to output optical backbone transmission lines OBB-21 to

OBB-24. The optical regenerators 52-1 to 52-16 each convert the optical path signal of one wavelength to an electrical signal, and applies it to a laser light source, thereby generating an amplified and shaped optical path signal.

5. Claims 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beshai, in view of Sinclair, in view of Uematsu, in view of Watanabe.

In regards to claims 18, 19, Beshai, in view of Sinclair, in view of Uematsu teach an optical switching node as described in the rejection of claim 1 above.

In regards to claims 18 and 19, Beshai, in view of Sinclair, in view of Uematsu do not explicitly teach first module comprises an optical regenerator module for simultaneously performing an optical regeneration process on a plurality of wavelength channels and second module comprises an optical regenerator module for performing an optical regeneration process on a wavelength channel.

In regards to claims 18 and 19, Watanabe teaches (column 2 lines 1-21) of using optical regenerator in an optical switch during optical switching.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Beshai, in view of Sinclair in view of Uematsu's teaching by incorporating the teaching of using optical regenerator in an optical switch during optical switching as taught by Watanabe. Such techniques were well known to one of ordinary skills in the art at the time of the invention. Further motivation is that (as suggested by Watanabe, column 2 lines 1-21) in the WDM communication channel, wavelength-multiplexed signals WDMS provided to input optical backbone transmission

lines OBB-11 to OBB-14 are demultiplexed for each wavelength in wavelength demultiplexing parts 51-1 to 51-3, then the optical signals of the individual wavelengths are regenerated by optical regenerators 52-1 to 52-16, respectively, then the regenerated optical signals are cross-connected by optical switches 53-1 to 53-4 to predetermined routes and are multiplexed in wavelength multiplexing parts 54-1 to 54-4, from which the wavelength-multiplexed optical signals are provided to output optical backbone transmission lines OBB-21 to OBB-24. The optical regenerators 52-1 to 52-16 each convert the optical path signal of one wavelength to an electrical signal, and applies it to a laser light source, thereby generating an amplified and shaped optical path signal.

Allowable Subject Matter

6. Claims 2, 13, 23 and 33 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

7. Prior art pertinent to the application but not used in office action:

- US 6456594 B1 USPATMulti-protocol communications routing optimization Kaplan; Allen D. et al.
- US 6798991 B1 USPATOptical communication systems, optical communication system terminal facilities, optical communication methods,

and methods of communicating within an optical networkDavis; Gary B. et al.

- US 20020018264 A1 US-PGPUBDynamic path routing with service level guarantees in optical networks Kodialam, Muralidharan S. et al.
- US 4737951 A USPATExchange with error correction Kruger; Johann E. W. et al.
- US 5884036 A USPAT Method for determining the topology of an ATM network having decreased looping of topology information cells Haley; Andrew Paul

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Salman Ahmed whose telephone number is (571)272-8307. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571)272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Salman Ahmed
Examiner
Art Unit 2666

SA